CLAIMS

1. A method of performing Fourier transform for N_c subbands among N total subbands, where $N > N_c > 1$, the method comprising:

rotating a first sequence of N input samples to obtain a second sequence of N rotated input samples;

accumulating the second sequence of N rotated input samples to obtain a third sequence of N_c time-domain values, wherein the accumulating is performed for each of N_c sets of L rotated input samples, where $N_c \cdot L = N$; and

performing an N_c-point fast Fourier transform (FFT) on the third sequence of N_c time-domain values to obtain N_c frequency-domain values for the N_c subbands.

2. The method of claim 1, wherein each of the N input samples is rotated by multiplying the input sample with $W_N^{mn} = e^{-j\frac{2\pi mn}{N}}$, where n in an index for the input sample in the first sequence and m is an index for a subband group that includes the N_c subbands.

3. The method of claim 1, wherein each of the N_c sets includes every N_c-th rotated input samples in the second sequence, starting with a different rotated input sample.

4. The method of claim 1, wherein the N input samples are for one orthogonal frequency division multiplexing (OFDM) symbol, and wherein the N_c frequency-domain values are for N_c received symbols for the N_c subbands.

5. The method of claim 1, wherein the N_c subbands include every L-th subband among the N total subbands.

6. An apparatus operable to perform Fourier transform for N_c subbands among N total subbands, where $N > N_c > 1$, the apparatus comprising:

a rotator operative to rotate a first sequence of N input samples to obtain a second sequence of N rotated input samples;

an accumulator operative to accumulate the second sequence of N rotated input samples to obtain a third sequence of N_c time-domain values, wherein the accumulation is performed for each of N_c sets of L rotated input samples, where $N_c \cdot L = N$; and

a fast Fourier transform (FFT) unit operative to perform an N_c-point fast Fourier transform on the third sequence of N_c time-domain values to obtain N_c frequency-domain values for the N_c subbands.

7. An apparatus operable to perform Fourier transform for N_c subbands among N total subbands, where $N > N_c > 1$, the apparatus comprising:

means for rotating a first sequence of N input samples to obtain a second sequence of N rotated input samples;

means for accumulating the second sequence of N rotated input samples to obtain a third sequence of N_c time-domain values, wherein the accumulation is performed for each of N_c sets of L rotated input samples, where $N_c \cdot L = N$; and

means for performing an N_c-point fast Fourier transform (FFT) on the third sequence of N_c time-domain values to obtain N_c frequency-domain values for the N_c subbands

8. A method of performing channel estimation in a communication system, comprising:

performing a Fourier transform on a sequence of input samples to obtain received pilot symbols for a first group of subbands;

obtaining a first group of channel gain estimates for the first group of subbands based on the received pilot symbols; performing an inverse fast Fourier transform (IFFT) on the first group of channel gain estimates to obtain a sequence of time-domain channel gain values;

rotating the sequence of time-domain channel gain values to obtain a first sequence of rotated channel gain values for a second group of subbands; and

performing a fast Fourier transform (FFT) on the first sequence of rotated channel gain values to obtain a second group of channel gain estimates for the second group of subbands.

9. The method of claim 8, wherein the performing the Fourier transform includes

rotating the sequence of input samples to obtain a sequence of rotated input samples,

accumulating the sequence of rotated input samples, in sets of L rotated input samples, to obtain a sequence of time-domain input values, where $L > 1$, and

performing a fast Fourier transform on the sequence of time-domain input values to obtain the received pilot symbols.

10. The method of claim 8, further comprising:

derotating the sequence of time-domain channel gain values to obtain a sequence of derotated time-domain channel gain values, and wherein the sequence of derotated time-domain channel gain values is rotated to obtain the first sequence of rotated channel gain values for the second group of subbands.

11. The method of claim 8, further comprising:

rotating the sequence of time-domain channel gain values to obtain a second sequence of rotated channel gain values for a third group of subbands; and

performing a fast Fourier transform on the second sequence of rotated channel gain values to obtain a third group of channel gain estimates for the third group of subbands.

12. The method of claim 8, wherein the first group of channel gain estimates is obtained by multiplying each of the received pilot symbols with a conjugated pilot symbol corresponding to the received pilot symbol.

13. An apparatus operable to perform channel estimation in a communication system, comprising:

a Fourier transform unit operative to perform a Fourier transform on a sequence of input samples to obtain received pilot symbols for a first group of subbands;

a pilot demodulator operative to obtain a first group of channel gain estimates for the first group of subbands based on the received pilot symbols;

an inverse fast Fourier transform (IFFT) unit operative to perform an inverse fast Fourier transform on the first group of channel gain estimates to obtain a sequence of time-domain channel gain values;

a first rotator operative to rotate the sequence of time-domain channel gain values to obtain a first sequence of rotated channel gain values for a second group of subbands; and

a first fast Fourier transform (FFT) unit operative to perform a fast Fourier transform on the first sequence of rotated channel gain values to obtain a second group of channel gain estimates for the second group of subbands.

14. The apparatus of claim 13, wherein the Fourier transform unit includes

a second rotator operative to rotate the sequence of input samples to obtain a sequence of rotated input samples,

an accumulator operative to accumulate the sequence of rotated input samples, in sets of L rotated input samples, to obtain a sequence of time-domain input values, where $L > 1$, and

a second fast Fourier transform unit operative to perform a fast Fourier transform on the sequence of time-domain input values to obtain the received pilot symbols.

15. The apparatus of claim 13, further comprising:

a second rotator operative to rotate the sequence of time-domain channel gain values to obtain a second sequence of rotated channel gain values for a third group of subbands; and

a second fast Fourier transform unit operative to perform a fast Fourier transform on the second sequence of rotated channel gain values to obtain a third group of channel gain estimates for the third group of subbands.

16. An apparatus operable to perform channel estimation in a communication system, comprising:

means for performing a Fourier transform on a sequence of input samples to obtain received pilot symbols for a first group of subbands;

means for obtaining a first group of channel gain estimates for the first group of subbands based on the received pilot symbols;

means for performing an inverse fast Fourier transform (IFFT) on the first group of channel gain estimates to obtain a sequence of time-domain channel gain values;

means for rotating the sequence of time-domain channel gain values to obtain a first sequence of rotated channel gain values for a second group of subbands; and

means for performing a fast Fourier transform (FFT) on the first sequence of rotated channel gain values to obtain a second group of channel gain estimates for the second group of subbands.

17. A method of performing demodulation in a communication system utilizing orthogonal frequency division multiplexing (OFDM), comprising:

performing a partial Fourier transform on a sequence of N input samples for an OFDM symbol to obtain a first group of N_c received symbols for a first group of N_c subbands, where $N > N_c > 1$, and wherein the partial Fourier transform utilizes an N_c-point fast Fourier transform (FFT) to obtain the first group of N_c received symbols;

obtaining a first group of channel gain estimates for the first group of subbands; and

processing the first group of received symbols with the first group of channel gain estimates to obtain a first group of recovered data symbols for the first group of subbands.

18. The method of claim 17, wherein the communication system includes N total subbands, and wherein the N_c subbands in the first group include every L-th subband among the N total subbands, where $L > 1$.

19. The method of claim 17, wherein the obtaining the first group of channel gain estimates includes

obtaining time-domain channel gain values for a group of pilot subbands based on the sequence of N input samples,

rotating the time-domain channel gain values to obtain a first sequence of rotated channel gain values for the first group of subbands, and

performing a fast Fourier transform on the first sequence of rotated channel gain values to obtain the first group of channel gain estimates for the first group of subbands.

20. The method of claim 19, further comprising:

performing a partial Fourier transform on the sequence of N input samples to obtain a second group of N_c received symbols for a second group of N_c subbands;

rotating the time-domain channel gain values to obtain a second sequence of rotated channel gain values for the second group of subbands;

performing a fast Fourier transform on the second sequence of rotated channel gain values to obtain a second group of channel gain estimates for the second group of subbands; and

processing the second group of received symbols with the second group of channel gain estimates to obtain a second group of recovered data symbols for the second group of subbands.

21. The method of claim 17, wherein the first group of recovered data symbols is obtained by dividing the first group of received symbols by the first group of channel gain estimates.

22. The method of claim 17, wherein the communication system is an orthogonal frequency division multiple access (OFDMA) system.

23. An apparatus in a communication system utilizing orthogonal frequency division multiplexing (OFDM), comprising:

a Fourier transform unit operative to perform a partial Fourier transform on a sequence of N input samples for an OFDM symbol to obtain a first group of N_c received symbols for a first group of N_c subbands, where $N > N_c > 1$, and wherein the Fourier transform unit utilizes an N_c-point fast Fourier transform (FFT) to obtain the first group of N_c received symbols;

a channel estimator operative to obtain a first group of channel gain estimates for the first group of subbands; and

an equalizer operative to process the first group of received symbols with the first group of channel gain estimates to obtain a first group of recovered data symbols for the first group of subbands.

24. The apparatus of claim 23, wherein the Fourier transform unit is operative to perform a second partial Fourier transform on the sequence of N input samples to obtain a second group of N_c received symbols for a second group of N_c subbands, wherein the channel estimator is operative to obtain a second group of channel gain estimates for the second group of subbands, and wherein the equalizer is operative to process the second group of received symbols with the second group of channel gain estimates to obtain a second group of recovered data symbols for the second group of subbands.

25. An apparatus operable to perform demodulation in a communication system utilizing orthogonal frequency division multiplexing (OFDM), comprising:

means for performing a partial Fourier transform on a sequence of N input samples for an OFDM symbol to obtain a first group of N_c received symbols for a first group of N_c subbands, where $N > N_c > 1$, and wherein the partial Fourier transform utilizes an N_c-point fast Fourier transform (FFT) to obtain the first group of N_c received symbols;

means for obtaining a first group of channel gain estimates for the first group of subbands; and

means for processing the first group of received symbols with the first group of channel gain estimates to obtain a first group of recovered data symbols for the first group of subbands.